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(54) Positioning apparatus for flexible printing plates.

(57) The invention concerns an apparatus for the locating of flexible printing plates (27) on printing cilinders (5). The flexible printing plates (27) to be located on a printing cilinder (5) each comprise two marks (16), and when those two marks are correctly located, the printing plates are positioned correctly. Two light sources (13) are provided each emitting a narrow beam towards the printing plate, so that two markings are projected on the locations of the marks of the printing plate to be fixed. Thus the location of the printing plate can easily take place. Further the projected markings are used to measure a length of adhesive foil such that said length fits exactly on the circumference of the printing cilinder.

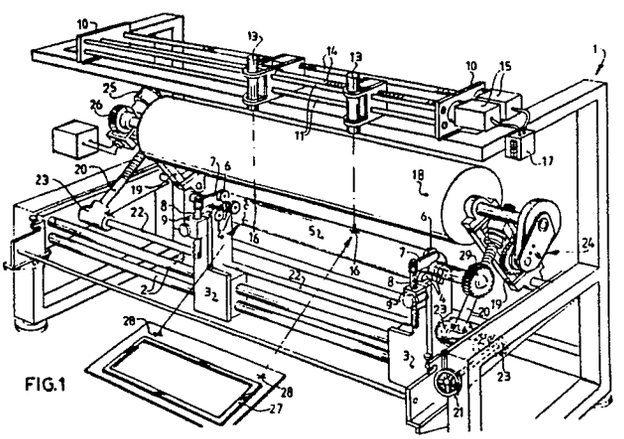

FIG.1

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POSITIONING APPARATUS FOR FLEXIBLE PRINTING PLATES

De present invention relates to the field of flexible printing plates and in particular to the fixing of such printing plates on printing cilinders.

The flexible printing plates, often used in modern printing techniques have to be fixed to a printing cilinder to be used in the printing process. Of course, the location thereof has to take place very accurate as the picture to be produced by the printing plate has to be provided exactly on the right location on the material to be printed. The requirements for accuracy become even greater when the material to be printed has to be printed subsequently with different colours. Hence, it is of utmost importance that such flexible printing plates are positioned as accurate as possible on the printing cilinder.

Hitherto, such a positioning often took place by hand, in which the positioning of the printing plate was judged with the eye and was adapted where necessary. Often, a for instance pencil line, located on the cilinder, was used as a help, such that the side of the printing plate to be positioned was applied parallel thereto. Also trial prints were made to determine whether the printing plates located on the printing cilinders, were correctly positioned. It will be clear, that this procedure, as it was used until now, involved a substantial inaccuracy and besides, took a lot of time.

The present invention provides an apparatus and the method, according to which the printing plates can be applied very accurate on the printing cilinder.

This aim is reached by an apparatus for positioning a flexible printing plate comprising at least two marks on to the printing cilinder, in which at least two light sources have been provided to project positioning markings at the location of the marks to be fixed.

As use is made of the markings, being present on nearly every flexible printing plate, which were until now used for determining whether the printing plates were on the right spot, this apparatus can also be used for printing plates already existing. Thus it becomes possible to fix printing plates on the printing cilinder with a substantial amount of accuracy.

Subsequently, the present invention will be elucidated with the help of the accompanying drawings, in which:

fig. 1: is a schematic perspective view, partly broken away of an apparatus according to the present invention; and

fig. 2: is a schematic perspective view, partly broken away of the apparatus depicted in fig. 1 and comprising means for fixing double-sided-adhesive tape on the printing cilinder.

The apparatus depicted in fig. 1 comprises a frame 1 with two guiding shafts 2, onto which two movable supports 3 have been provided. Each of the supports 3 comprises two suspension wheels 4, onto which a pushing cilinder 5 can be located. The pushing cilinder 5 can be fixed onto the suspension wheels 4 by means of fixation wheels 6, which have been provided through a bracket 7, a rack 8 and a guiding element 9. The printing cilinder 5 locted on the supporting wheels 4 can rotate freely.

At the upper side of the frame two plates 10 have been fixed, through which two guiding shafts 11 have been provided such that these are parallel to the shafts of the printing cilinder 5. Two yokes 12 are movable along these guiding shafts 11 and in each of the yokes 12 a laser light source 13 has been provided. Each of the laser light sources 13 is driven by means of a spindle shaft 14, which is driven by means of a motor 15. When switched on, both laser light sources emit a narrow ray of laser light downwards unto the printing cilinder 5. Thus, two for instance cross-shaped positioning markings 16 are projected on the printing cilinder 5.

Each of the motors 15 is connected with a control unit 17, which can dictate the position of both laser light sources 13 by means of the motors 15 and the spindle shafts 14.

A pressing roller 18 has been provided to the frame such by means of two yokes 19, that this pushing roller 18 can be located adjacent with the printing cilinder 5, in which account is taken of printing cilinders with different diameters by the movability of the pushing roller 18. The position of the pushing roller 18 is adjustable by means of two spindle shafts 20 which are actuable simultaneously. Both spindle shafts 20 are driven by means of a hand wheel, a driving shaft 22 and several conical gear transmissions 23. At the outer side of one of the yokes 19 a coupling apparatus 24 has been provided, with which, when the pushing roller 18 as adjacent to the pushing roller 5, both rollers are connected for rotation. Futher, the pushing roller 18 comprises a driving motor 25, which drives the pushing roller 18 through a worm-wheel transmission 26.

Subsequently, the action of the apparatus described above will be elucidated. Initially, the position of the marks 28 located on the printing plate 27 are fed in the control unit 17. It is, of course, also possible, that only the number of the printing plate 27 has to be entered and that the control unit 17 comprises a memory, in which, except the

number of the relevant printing plates, also the coördinates of the marks belonging thereto have been stored. Subsequent ly, the control unit 17 will make the motors 15 drive the laser light sources such that the laser light sources 13 both take such a position, that the required positioning markings 16 are projected on the relevant cilinder 5 on the required position.

Subsequently, the printing plate 27 can be positioned such on the printing cilinder 5, that the markings projected coïncide with the marks 28.

When this stage is reached, the pushing roller 18 is driven by means of the motor 25, through which through the coupling apparatus 14, the printing cilinder 5 is driven and the printing plate 27 is provided in the right position on the printing cilinder 5. Of course, it is possible that the back layer of the printing plate 27 or the circumference of the printing cilinder 5 has been provided with a suitable means of fixation.

In the embodiment shown in fig. 2, the printing cilinder 5 has been provided, of which the diameter is considerably larger than that of the printing cilinder 5, depicted in fig. 1. Further it is shown, that the printing roller 18 is moved until it is adjacent the printing cilinder 5.

Further this embodiment comprises a shaft, extending parallel to the axis of the printing cilinder 5, onto which a coil 31 of double-sided-adhesive foil has been provided. At the upper side, this foil comprises a layer of protective paper. On a shaft 32, also being provided parallel to the axis of the printing cilinder 5, a cutting organ 33 has been provided, which is movable along this shaft, and which can cut the length 34 of double-sided-adhesive foil leading from the coil 31 towards the printing cilinder 5.

In the worm-wheel transmission 26 an angle rotation sensor 35 has been provided, which is connected with the signal generator 36. The angle rotation sensor 35 serves to divide the circumference of the printing cilinder 5, which is of importance to determine the initial position of the printing plate departing from an inital or zero-position of the printing cilinder. Further this is necessary when the prin ting plate 27 does not extend over the whole circumference and when several printing plates 27 have to be provided on the circumference.

To provide a layer of double-sided-adhesive foil on the printing cilinder 5 with this embodiment, one handles as follows: initially the diameter of the printing cilinder 5 is fed into the signal generator 36. Of course, it is possible that, when entering the number of the required printing plate into the control unit 17, the diameter belonging thereto is directly fed to the signal generator 36.

Subsequently, two positioning markings are being projected on the printing cilinder 5 by means of the laser light sources 13. Afterwards, so much foil is unwound from the coil 31, that the free end of the length 34 coïncides with the projected positioning markings 16. Then the pushing roller 18 is driven by means of the motor 25, in which also the pushing roller is driven through the coupling apparatus 24 and the gear 29 provided at the pushing roller, so that the foil is fixed on the printing cilinder 5. This is continued until the signal generator 36 generates a signal stopping the motor 25.

Then the stroke 34 of foil is cut through by means of the cutting organ 33, after which the pushing process is continued by means of the motor 25, until the stroke 34 cut of is completely located on the printing roller.

The dimensioning of the cutting organ 33 and of the required angle of rotation of the printing cilinder 5 and thus of the pushing roller 18, which are sensed by the angle rotation sensor 36, is such, that the length of the stroke 34 of foil cut off suits exactly the circumference of the printing cilinder 5. This avoids, that a part of the printing cilinder is covered with a double layer of foil, or that a slit developes in the layer of foil. Subsequently the layer of covering paper can be removed from the foil, and the printing plate can be fixed by means of the method described with the help of fig. 1.

In the embodiment shown of the present invention, use is made of laser light sources, as the ray of light emitted by these sources is so parallel that also with printing cilinders with different diameter, a projection which is focussed sufficiently, and which is thus accurately is obtained. When applying printing cilinders with one single diameter, a classical, not-coherent light source will suffice.

It is also possible to provide video-cameras and to record the projected laser marks and to display these through a displaying apparatus of a large size. This allows small relocations of the printing plate to be displayed on an enlarged scale, so that the positioning process can take place more accurately.

Claims

1. Apparatus for positioning a flexible printing plate comprising at least two markings onto a printing cilinder, in which at least two light sources have been provided to project positioning markings on the printing plate at the location of the marks to be applied.

2. Apparatus according to claim 1, **characterized in** that the light sources are laser light sources.

3. Apparatus according to claim 1 or 2, **characterized in** that the light sources are both movable parallel to the axis of the printing cilinder.

4. Apparatus according to claim 3, **characterized** by a memory for storing the coordinates of the marks of the flexible printing plates and by means for relocating the light sources such that the projected positioning markings are coïncident with the marks of the printing plate to be positioned.

5. Apparatus according to claim 4, **characterized in** that the memory is a part of a computer system in which at least one reference number and the coordinates of the marks for every printing plate have been stored.

6. Apparatus according to one of the preceding claims, **characterized in** that at least one camera directed to each of the positioning marks has been provided. and that at least one monitor, representing the image of the camera has been provided.

7. Apparatus according to one of the preceding claims, **characterized by** two bearings for the printing cilinder, which bearings are movable parallel to the axis of the printing cilinder, and a pressing roller, which pressing roller is movable until adjacent to the printing cilinder, and by a driving apparatus for the printing cilinder and the pressing roller, driving both simultaneously.

8. Apparatus according to one of the preceding alaims, **characterized by** a shaft, provided parallel to the axis of the cilinder for storing a storage roller of double-sided-adhesive foil, a cutting organ movable parallel to the shaft, and provided on a fixed distance thereto; an element for measuring the angle of rotation of the printing roller; and a signalling element for generatinga signal when the rotation angle element has registered a pre-determined rotation; and such that the length of the piece of foil cut from the cutting organ is equal to the circumference of the relevant printing cilinder.

9. Method for fixing a flexible printing plate on a printing cilinder, **characterized by** the following steps: projecting at least two positioning markings at the location of the marks present on the printing plate; and positioning the printing plates such that the marks coïncide with the projected positoning markings.

10. Method according to claim 1, **characterized in** that before the positioning of the printing plate on the printing cilinder double-sided-adhesive foil is provided on the printing cilinder, wherein the free end of the length of adhesive foil is provided such unto the printing cilinder, that this end coïncides with at least two projected positioning marks; the turning of the printing cilinder towards a pre-determined position; and the cutting by means of a cutting organ of the twin-adhesive foil; and providing the rest part of the cut off stroke of foil, in which the dimensioning of the cutting organ and of the predetermined position is such, that the whole circumference of the printing cilinder is covered with one layer of foil.

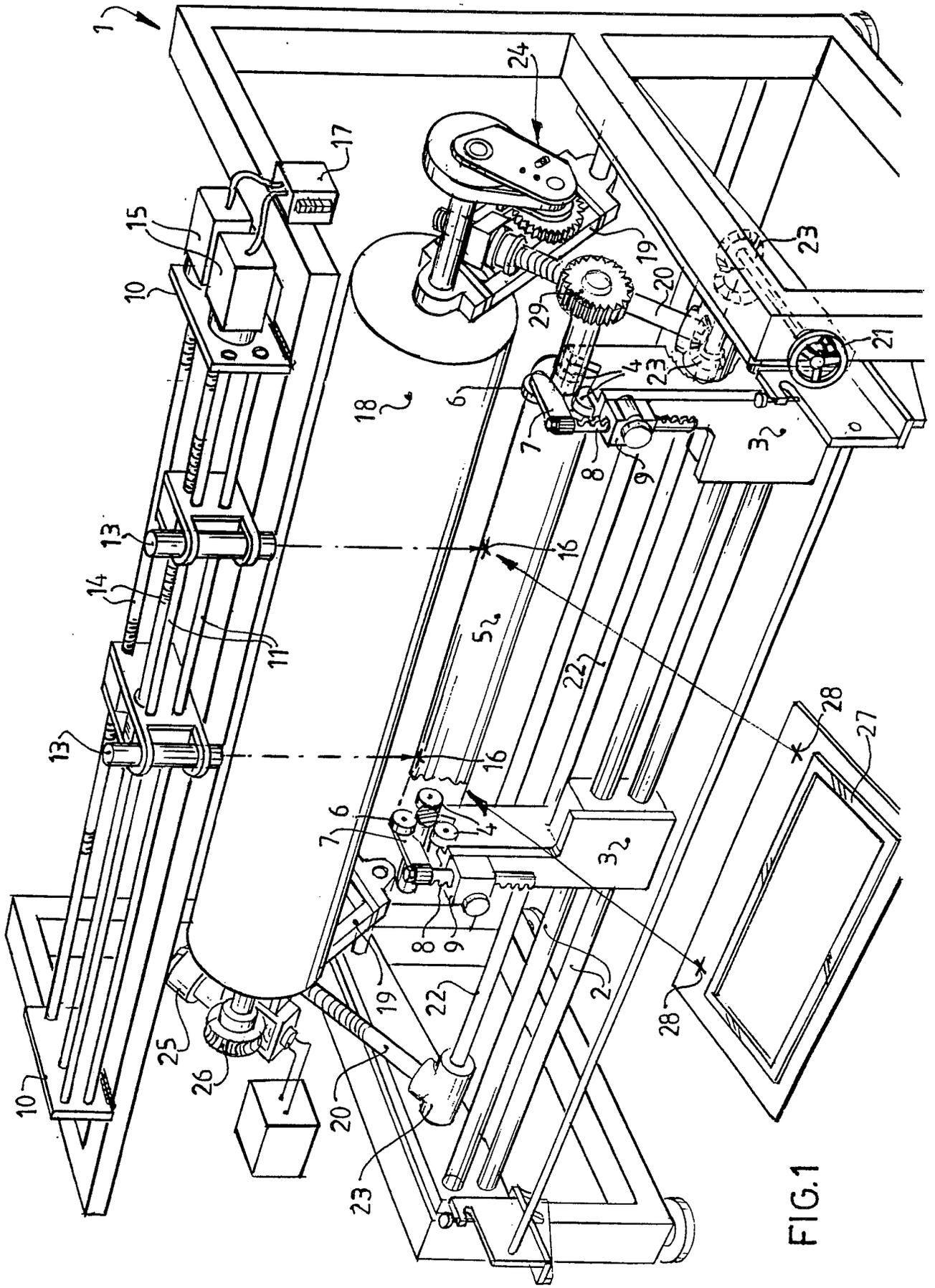

FIG.1

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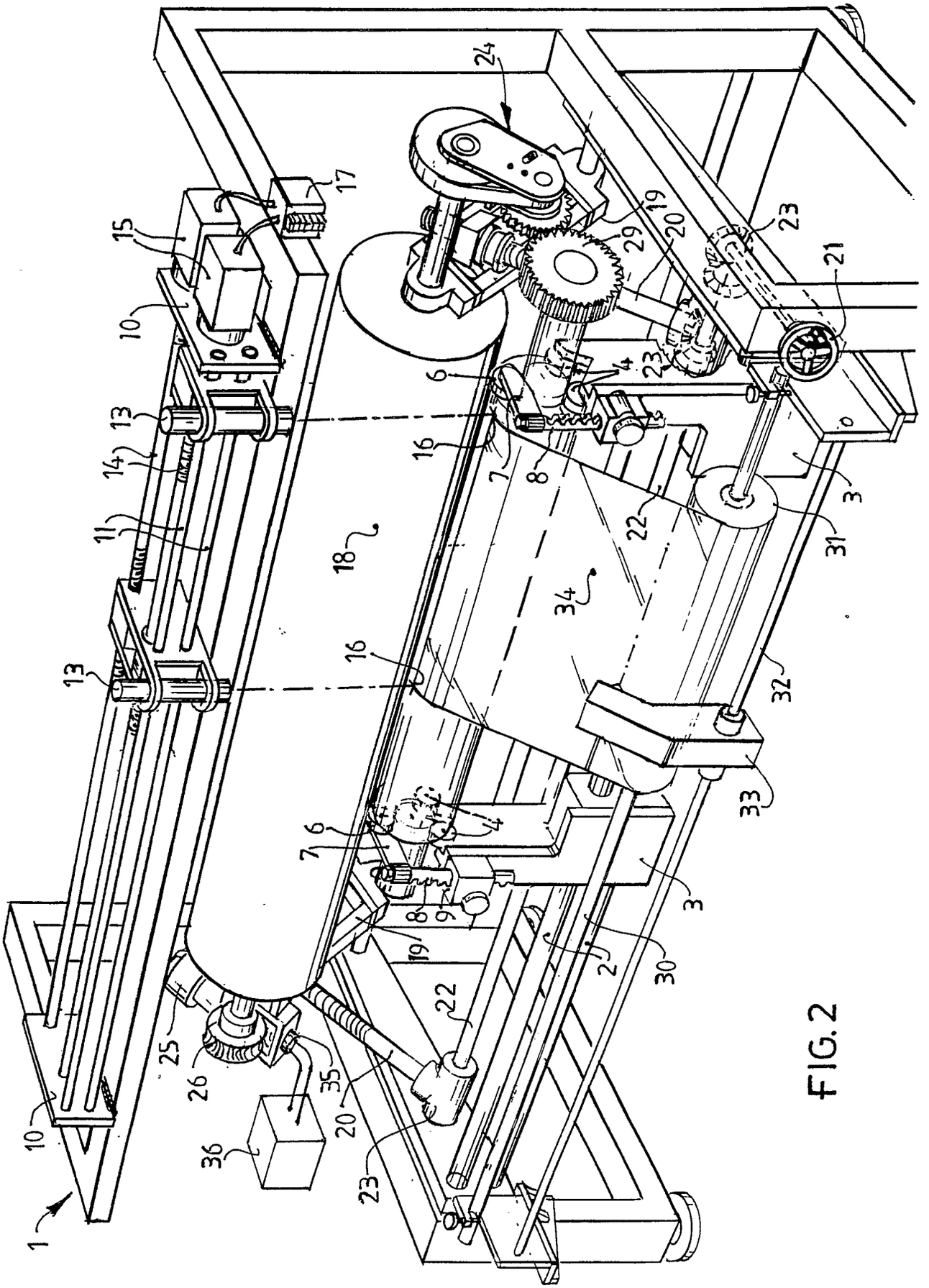
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FIG.2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 20 0301

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	US-A-3616055 (DAVID H. MAGES) * the whole document *	1-10	B41F27/00
Y	US-A-3186060 (H.H.RIDDERVOLD) * the whole document *	1-10	
Y	EP-A-0089015 (WINDMOLLER & HOLSCHER) * the whole document *	1-10	
A	DE-C-3136703 (M.A.N. ROLAND DRUCKMASCHINEN A.G.) * the whole document *	1-6	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B41F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17 MAY 89	MEULEMANS J.P.

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